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(71) Applicant: **Tecant Engineering Srl.**
31032 Lughignano di Casale sul Sile (TV) (IT)

(72) Inventor: **Ferrari, Luciano**
31030, Dosson di Casier (TV) (IT)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Piazzale Cavedalis 6/2
33100 Udine (IT)

(54) **Soundabsorbing and/or soundproofing module and soundproofing wall made with said module**

(57) Soundabsorbing and/or soundproofing module (11) for a soundproofing wall (10), comprising a panel (13) at least partly made of soundabsorbing and/or soundproofing material. The panel (13) is of the modular type, and comprises at least a first head surface (13a) with which a first semi-upright element (15) is associated, and a second head surface (13b) with which a corresponding second semi-upright element (16) is associated. The first semi-upright element (15) is shaped so as to be able to be coupled with the second (16) semi-upright element of an analogous adjacent module (11), so as to constitute at least an upright (22) of the soundproofing wall (10).

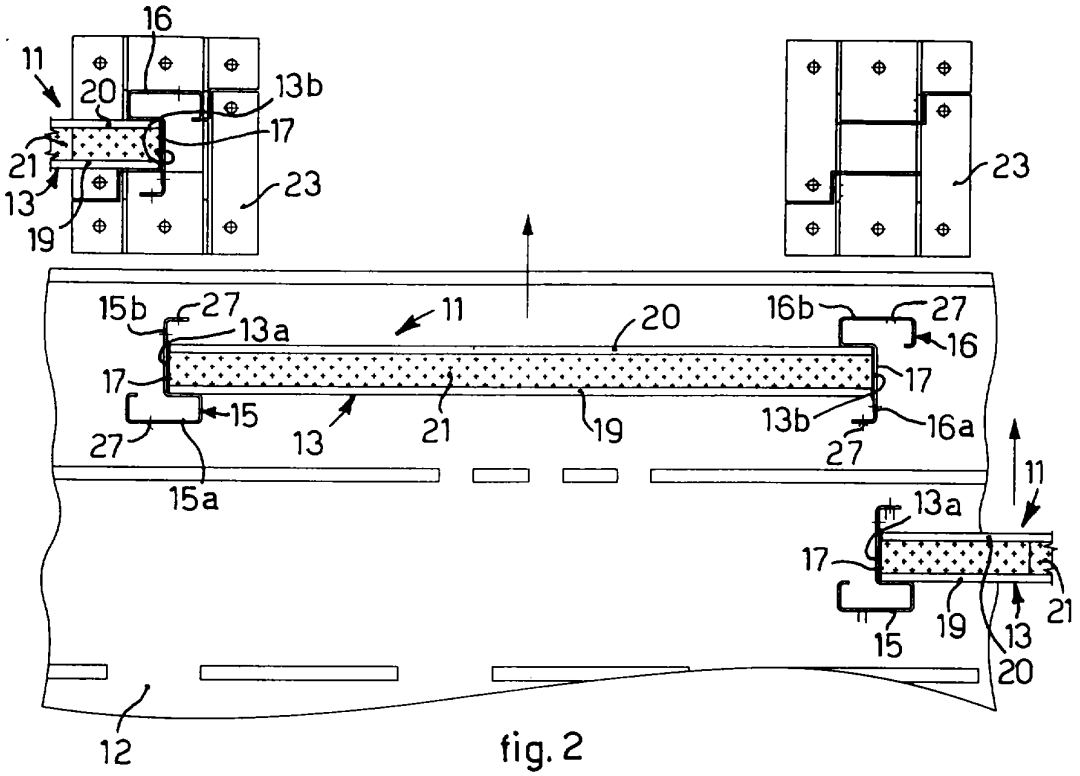

fig. 2

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a soundabsorbing and/or soundproofing module, and the soundproofing wall made therewith, for example of the type that can be positioned at the side of roads, motorways, railways or other big communication routes, in order to limit the propagation towards the outside of the noise produced by the moving vehicles.

BACKGROUND OF THE INVENTION

[0002] Soundproofing walls are known, disposed at the sides of big communication routes, such as roads, motorways, railways or other, which allow to limit the propagation towards the outside of the noise produced by vehicles in transit, such as cars, trucks, trains, or other, in order to limit noise pollution in residential or industrial areas, built along such routes.

[0003] Soundproofing walls of the known type normally consist of a plurality of soundabsorbing and/or soundproofing modules, entire or sectional, in this case formed by several longitudinal panels which are coupled together.

[0004] Such modules are disposed longitudinally adjacent to each other for a lateral segment of the communication route, they normally have a height comprised between about 2500-4000 mm, particularly of about 3000 mm, and are connected to each other by lateral uprights, which are made of H shaped beams fixed to the ground beforehand by means of set screws, plinths or other.

[0005] Each module is positioned by inserting the head surfaces of the module from above between two consecutive H uprights.

[0006] Moreover, in correspondence with the head surfaces that cooperate with the respective uprights, packing or sealing elements are associated with each module, which allow to recover the design tolerances and/or to compensate for slight positioning errors and/or possible structural deformations due for example to the variations in the ambient temperature.

[0007] The state of the art has several disadvantages, including the fact that the uprights must be fixed beforehand and individually in the ground with great precision of reciprocal alignment.

[0008] Another disadvantage is that the modules, since they have to be inserted between the uprights from above, must be lifted, by means of bulky cranes and/or lifters, up to a height greater than that of the uprights, even more than 4000 mm, to allow a correct positioning thereof.

[0009] These disadvantages entail relatively long installation times, making it necessary to use very bulky equipment and machines, with the consequent need to reduce, if not to interrupt, the usability of the route, thus causing possible inconvenience and delays for the traffic.

[0010] Moreover, the components of the soundproofing wall must be transported to the site one by one and mounted and assembled there, causing a considerable increase in times and costs.

[0011] Another disadvantage is the difficulty in correctly positioning the packing elements along the head surfaces of the modules, which entails a further lengthening of the installation times. Moreover, the packing elements, due to the type of material used and how they are installed, tend to lose over time their characteristics of elasticity and consequently the effectiveness of their functions.

[0012] It must also be considered that the building sites where soundproofing walls are installed are often set up in contexts where it is not possible to have optimum operating conditions for the workers, for example due to the atmospheric agents, working at night, the limited space for maneuver, with a consequent lowering of quality and reliability of the wall made.

[0013] One purpose of the present invention is therefore to perfect a soundabsorbing and/or soundproofing module which allows to make a soundproofing wall in a simple, rapid and efficient manner, limiting to a minimum the times of intervention, the costs and hence the possible inconvenience and delays for the traffic.

[0014] Another purpose of the present invention is to perfect a soundabsorbing and/or soundproofing module which allows to make a soundproofing wall with a high level of quality, even if the installation site is not set up in optimum operating conditions.

[0015] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0016] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0017] In accordance with the above purposes, a soundabsorbing and/or soundproofing module for a soundproofing wall according to the present invention comprises at least a panel made at least partly of soundabsorbing and/or soundproofing material.

[0018] According to a characteristic feature of the present invention, the panel is of the modular type, that is, able to be coupled with other analogous panels, and comprises at least a head surface, which is provided with at least a first semi-upright element shaped so as to be able to be coupled with a corresponding second semi-upright element of an analogous adjacent module, in order to constitute, at the moment of coupling, a relative upright for the soundproofing wall, also defining in this way a structural continuity between two adjacent modules.

[0019] With the present invention, each upright is de-

fined by the reciprocal coupling of two adjacent modules, thus avoiding the operations to fix it beforehand to the ground, since the uprights formed are fixed to common base set screws, as the modules are progressively disposed one next to the other.

[0020] The solution according to the present invention also allows to reciprocally couple the two adjacent modules simply by locating them adjacently together in a horizontal direction, that is, without needing excessive lifting with respect to the ground.

[0021] With the present invention therefore, the installation times are considerably reduced, avoiding the complex step of prior fixing of the uprights. This allows to limit to a minimum the intervention times and hence possible inconvenience and delays for the traffic.

[0022] Advantageously, the panel also comprises sealing means, for example with a strip, disposed in advance in an intermediate position between the head surface and the corresponding semi-upright element, in order to seal the space between the panel and the respective semi-upright element, and absorb the dimensional tolerances of the components, the dilation of the materials due to temperature differences, and also possible sound transmissions.

[0023] In this way, each module according to the present invention is completely pre-fabricated, which reduces the packing and transport costs, and further simplifies the installation operations, with a consequent further reduction in the intervention times.

[0024] In a preferential embodiment of the present invention, attachment means are provided, for example screws, which allow to reciprocally fix the first semi-upright element and the second semi-upright element of the adjacent module.

[0025] Advantageously, the attachment means act in such a manner as to cause the first and second semi-upright elements to clamp onto the panels of two adjacent modules, so as to ensure the compactness and structural continuity of the coupling of the two.

[0026] In one form of embodiment of the invention, the attachment position of the two semi-upright elements is located in correspondence with the median axis of the upright that is formed by the coupling; this guarantees that the attachment lies on the axis of resistance of the upright, and also supplies a symmetrical configuration to the coupling, bringing a better aesthetic appearance to the assembled wall.

[0027] With the present invention we therefore obtain a mechanical clamping of the modules, which is constant over time, with the possibility of consequently eliminating the plastic accessories of dimensional and anti-vibrational compensation between panels and uprights, normally used in known soundproofing walls and which, over time, due to the temperature and atmospheric variations, lose their compensation function.

[0028] In another preferred form of embodiment, each panel comprises a first head surface with which the first semi-upright element is associated, and a second head surface with which the second semi-upright element is associated, so as to be coupled on opposite sides with two adjacent modules.

[0029] In general, the invention guarantees a greater quality of the soundproofing wall since, being made by means of pre-fabricated modules in the production site, possible disadvantages and inevitable inattention that normally occur in the installation site are avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic front view of a soundproofing wall made with a plurality of soundabsorbing and/or soundproofing modules according to the present invention;
- fig. 2 is a schematic view from above of an assembly step of the soundproofing wall in fig. 1;
- fig. 3 is a schematic view from above of the soundproofing wall in fig. 1;
- fig. 4 shows an enlarged detail of fig. 3;
- fig. 5 shows a variant of the coupling of semi-upright elements in fig. 4;
- fig. 6 shows schematically an assembly sequence of the panels according to one embodiment of the invention.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0031] With reference to the attached drawings, a soundproofing wall 10 is shown, consisting of a plurality of modules 11 of the soundabsorbing and/or soundproofing type, in this case three, disposed aligned along the verge of a road, for example a motorway 12, to limit the propagation towards the outside of the noise produced by the vehicles passing thereon.

[0032] Each module 11 comprises a modular panel 13, and a first and a second semi-upright element 15 and 16 mounted on respective opposite head surfaces 13a and 13b of the panel 13. Each module 11 also comprises two sealing packings 17 interposed between the semi-upright elements 15 and 16 and the respective head surfaces 13a and 13b.

[0033] In particular, the panel 13 consists of two external sheets, respectively front 19 and rear 20, both made of sheet steel, aluminum, so-called "corten" steel sheet or other ductile material, which have a desired width and height according to the size of each module 11.

[0034] The panel 13 also comprises an intermediate layer 21, made of soundabsorbing and/or soundproofing material, for example, mineral wool or other, interposed between the two external sheets 19 and 20 and having

a thickness that varies according to the level of soundproofing required. The thickness is advantageously comprised between about 60 mm and about 150 mm.

[0035] The two external sheets 19 and 20 are preferably made by continuous profiling of two respective coils of sheet, so as to define deep longitudinal stiffening ribs 18, which also have the function of fixing the soundproofing layer 21 in the exact position.

[0036] In this case, the external front sheet 19 has a plurality of holes, not shown, of different diameters, for example comprised between about 3 mm and about 8 mm, to allow passage through them of the sound wave produced by the passing vehicles.

[0037] The first semi-upright element 15 comprises a box-shaped portion 15a (figs. 4 and 5) facing towards the external front sheet 19, and an attachment portion 15b facing towards the external rear sheet 20, while the second semi-upright element 16 comprises an attachment portion 16a facing towards the external front sheet 19 and able to cooperate with the box-shaped portion 15a of the first semi-upright element 15 of the adjacent module 11, and a box-shaped portion 16b facing towards the rear sheet 20 and with which the attachment portion 15b of the first semi-upright element 15 of the adjacent module 11 is able to cooperate.

[0038] The first semi-upright element 15 and the second semi-upright element 16 have a substantially specular configuration, so that the reciprocal cooperation between the first semi-upright element 15 of one module 11 and the second semi-upright element 16 of another module 11 defines a supporting upright 22 for two adjacent modules 11.

[0039] In the embodiment shown in fig. 4, the geometry of the semi-upright elements 15 and 16 is such that the reciprocal attachment with two screws 25, 26 occurs at two points not aligned with each other and specular with respect to the median axis of the upright 22 that is formed.

[0040] In the variant in fig. 5, on the contrary, the attachment portions 15a and 16a are shaped so as to allow the reciprocal attachment with the screws 25, 26 precisely in correspondence with the median axis of the upright 22, thus providing both high quality resistance and also high aesthetic quality of the upright 22 thus made.

[0041] After the semi-upright elements 15 and 16 have been fixed, the upright 22 is fixed on set screws 23, of a substantially known type, which are anchored to plinths or concrete foundation blocks, also of a known type.

[0042] For the application of the screws 25, 26, both the box-shaped portion 15a and the attachment portion 15b of the first semi-upright element 15, and the attachment portion 16a and the box-shaped portion 16b of the second semi-upright element 16 are provided with corresponding through holes 27.

[0043] As can be seen in figs. 4 and 5, the action of each screw 25 and 26 generates a clamping force that affects, by means of the corresponding box-shaped portion 15a or 16b, the front and rear sheets 19, 20 of the two modules 11, actuating a substantially clamping of the reciprocal panels 13.

[0044] The geometric configuration of the semi-upright elements 15 and 16 allows to consolidate in a stable manner the coupling of two adjacent modules 11, to define a mechanical structural continuity of the soundproofing wall 10 and to eliminate all vibrating effect between the panels 13 and uprights 22.

[0045] Each sealing packing 17 comprises a continuous self-adhesive strip made of plastic material, unaffected by atmospheric agents and fireproof, which is located vertically for the whole height of the panel 13 between the head surfaces 13a and 13b and the respective first and second semi-upright elements 15 and 16.

[0046] The width of the sealing packing 17 is substantially equal to the thickness of the panel 13, so as to prevent possible sound transmissions. The thickness of the sealing packing 17 can be compressed so as to allow the sealing of the space between modules 11 and upright 22, and to allow the absorption of the dimensional tolerances of the components, and also the dilation of the materials due to temperature differences.

[0047] The solution according to the present invention thus allows to achieve a soundproofing wall 10 by means of pre-fabricated modules 11.

[0048] The assembly sequence may provide, as in the case of fig. 2, the sequential insertion of the various modules 11 always from the same side, until the semi-upright elements 15 and 16 have been coupled in order to promote their reciprocal attachment.

[0049] According to the variant in fig. 6, each module 11 is configured so as to have the respective box-shaped portion 15a, 16b on the same side (internal or external) with respect to the road, as can be seen from the continuous line segment, while the adjacent module 11 will have the respective box-shaped portions 15a, 16b disposed on the opposite side.

[0050] In this way, by carrying out an assembly sequence of contiguous modules 11 with alternate insertion, from one side and the other, according to the arrows 40 and 41, and thanks to this position on the same side of the respective box-shaped portions 15a, 16b, the advantage is obtained that it is possible to remove even a single module 11 from the wall 10, for example for maintenance, repairs or replacement, without having to intervene on the other modules 11.

[0051] Advantageously, during the pre-assembly of the modules 11, positioning and dimensional reference equipment may be used, such as for example templates, which guarantee that the module 11 is made according to the dimensional standard and quality required.

[0052] It is clear, however, that modifications and/or additions of parts may be made to the soundproofing wall 10 and to the soundabsorbing and/or soundproofing module 11 as described heretofore, without departing from the field and scope of the present invention.

[0053] For example, it comes within the field of the present invention to provide that, instead of the two metal sheets 19 and 20 and the layer of mineral wool, the panel

13 consists of a single transparent layer, for example made of strips of polymethylacrylate. Alternatively, the panel 13 may consist of metal panels and transparent strips, in wood or in plastic, or of sandwich panels consisting of two external sheets of metal and a layer of ground plastic composite material, or concrete, or other material, according to the specific environmental conditions or soundproofing.

[0054] It also comes within the field of the invention to provide that each module 11 also comprises one or more accessories, such as for example diffractors, protective covers, flashings, base linings, longitudinal supporting packings or other.

[0055] According to an advantageous solution of the present invention, the module 11 comprises two or more panels 13 of the type described in a parallel application for industrial invention filed by the same Applicant.

[0056] The external sheets 19 and 20 of the panels 13 have upper portions reciprocally shaped in specular manner so as to define at least a male coupling edge, and lower portions reciprocally shaped in specular manner so as to define at least a female coupling edge.

[0057] The male edge is inserted into the corresponding female edge of an adjacent panel 13, to constitute a connection joint between the panels 13, and define a substantial structural continuity between the latter.

Claims

1. Soundabsorbing and/or soundproofing module for a soundproofing wall, comprising at least a panel (13) at least partly made of soundabsorbing and/or soundproofing material, **characterized in that** said panel (13) is of the modular type, and comprises at least a first head surface (13a) with which a first semi-upright element (15) is associated, and a second head surface (13b) with which a corresponding second semi-upright element (16) is associated, said first semi-upright element (15) being shaped so as to be able to be coupled with said second (16) semi-upright element of an analogous adjacent module (11), so as to constitute at least an upright (22) of said soundproofing wall (10).

2. Module as in claim 1, **characterized in that** said panel (13) also comprises sealing means (17) disposed at least in an intermediate position between said head surface (13a) and said first semi-upright element (15).

3. Module as in claim 1 or 2, **characterized in that** it also comprises attachment means (25, 26) able to reciprocally fix said first semi-upright element (15) and said second semi-upright element (16).

4. Module as in any claim hereinbefore, **characterized in that** said first semi-upright element (15) comprises a box-shaped portion (15a) facing towards a front surface (19) of said panel (13), and an attachment portion (15b) facing towards a rear surface (20) of said panel (13), opposite said front surface (19).

5. Module as in claim 4, **characterized in that** said second semi-upright element (16) comprises an attachment portion (16a) facing towards said front surface (19) and able to cooperate with said box-shaped portion (15a) of said first semi-upright element (15) of said adjacent module (11), and a box-shaped portion (16b) facing towards said rear surface (20) of said panel (13) and with which an attachment portion (15b) of said first semi-upright element (15) of said adjacent panel (13) is able to cooperate.

6. Module as in any claim hereinbefore, **characterized in that** said first semi-upright element (15) and said second semi-upright element (16) have a substantially specular configuration, so that the first semi-upright element (15) of one module (11) can be coupled with the second semi-upright element (16) of an analogous adjacent module (11).

7. Module as in claims 3 and 5, **characterized in that** said attachment means comprises at least a screw element (25) able to reciprocally fix said box-shaped portion (15a) of said first semi-upright element (15) with said attachment portion (16a) of said second semi-upright element (16) of said adjacent module (11).

8. Module as in claim 7, **characterized in that** said attachment means comprises another screw element (26) able to fix at least said attachment portion (15b) of said first semi-upright element (15) with said box-shaped portion (16b) of said second semi-upright element (16) of said adjacent module (11).

9. Module as in claims 7 and 8, **characterized in that** said screws (25, 26) are disposed offset with respect to each other and specular with respect to the median axis of the upright (22).

10. Module as in claims 7 and 8, **characterized in that** said screws (25, 26) are disposed aligned with each other and coaxial with the median axis of the upright (22).

11. Module as in claims 4 and 5, **characterized in that** it has the respective box-shaped portions (15a, 16b) of the semi-upright elements (15, 16) disposed on the same side, internal or external, with respect to the relative panel (13).

12. Soundproofing wall comprising a plurality of modules (11) connected to each other by a plurality of uprights (22), **characterized in that** each of said modules

(11) comprises at least a panel of the modular type having at least a head surface (13a) provided with at least a first semi-upright element (15) shaped so as to be able to be coupled with a corresponding second semi-upright element (16) of an analogous adjacent module (11), to constitute one of said uprights (22).

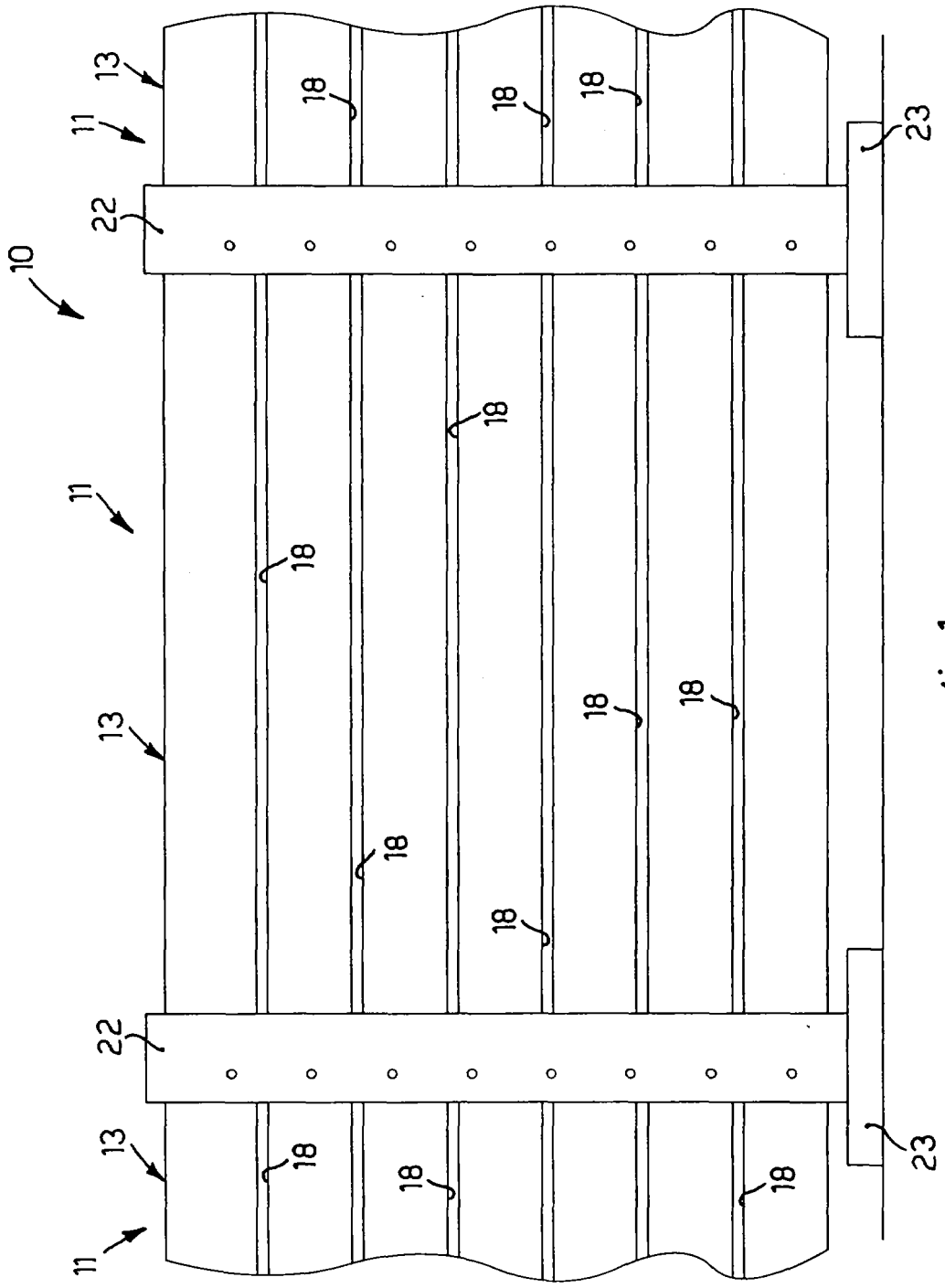

fig. 1

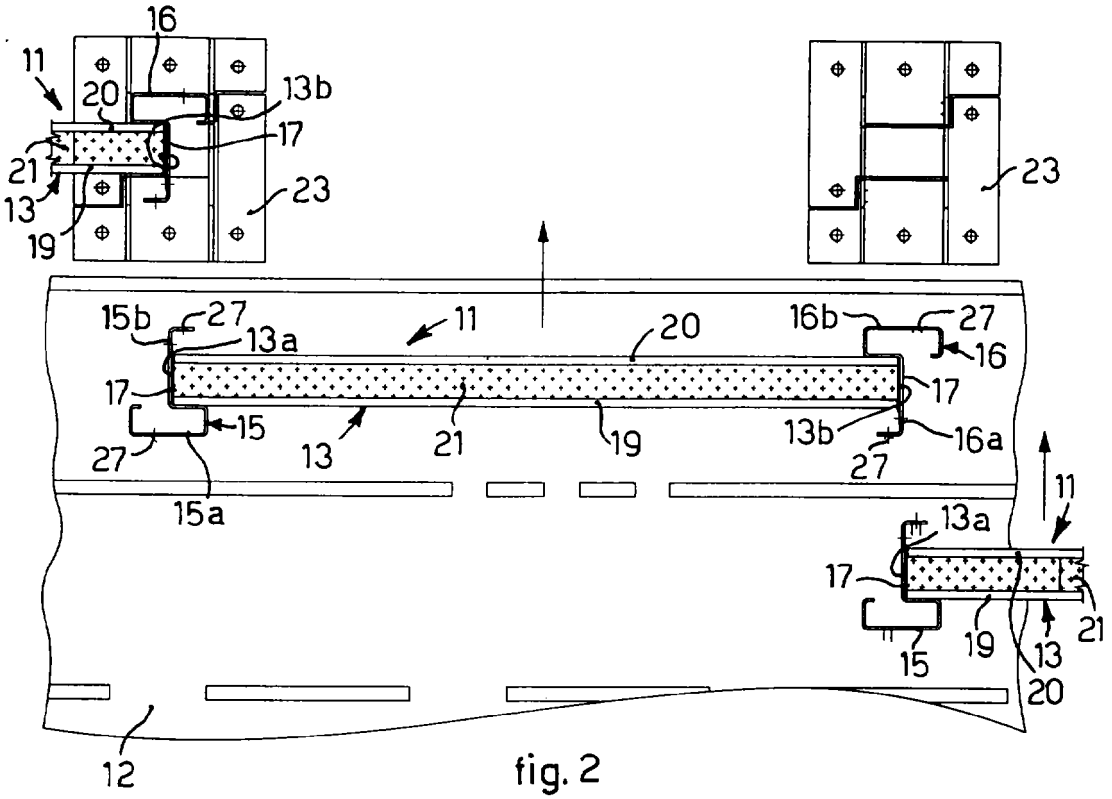
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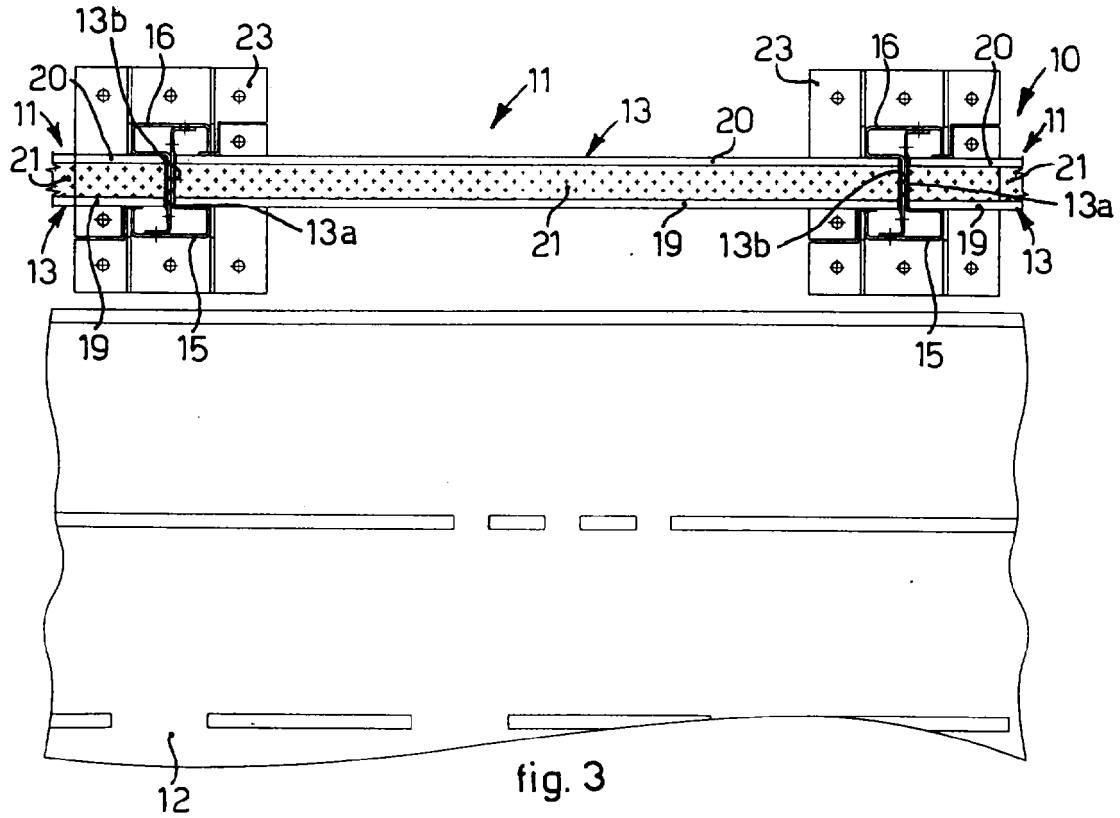
fig. 2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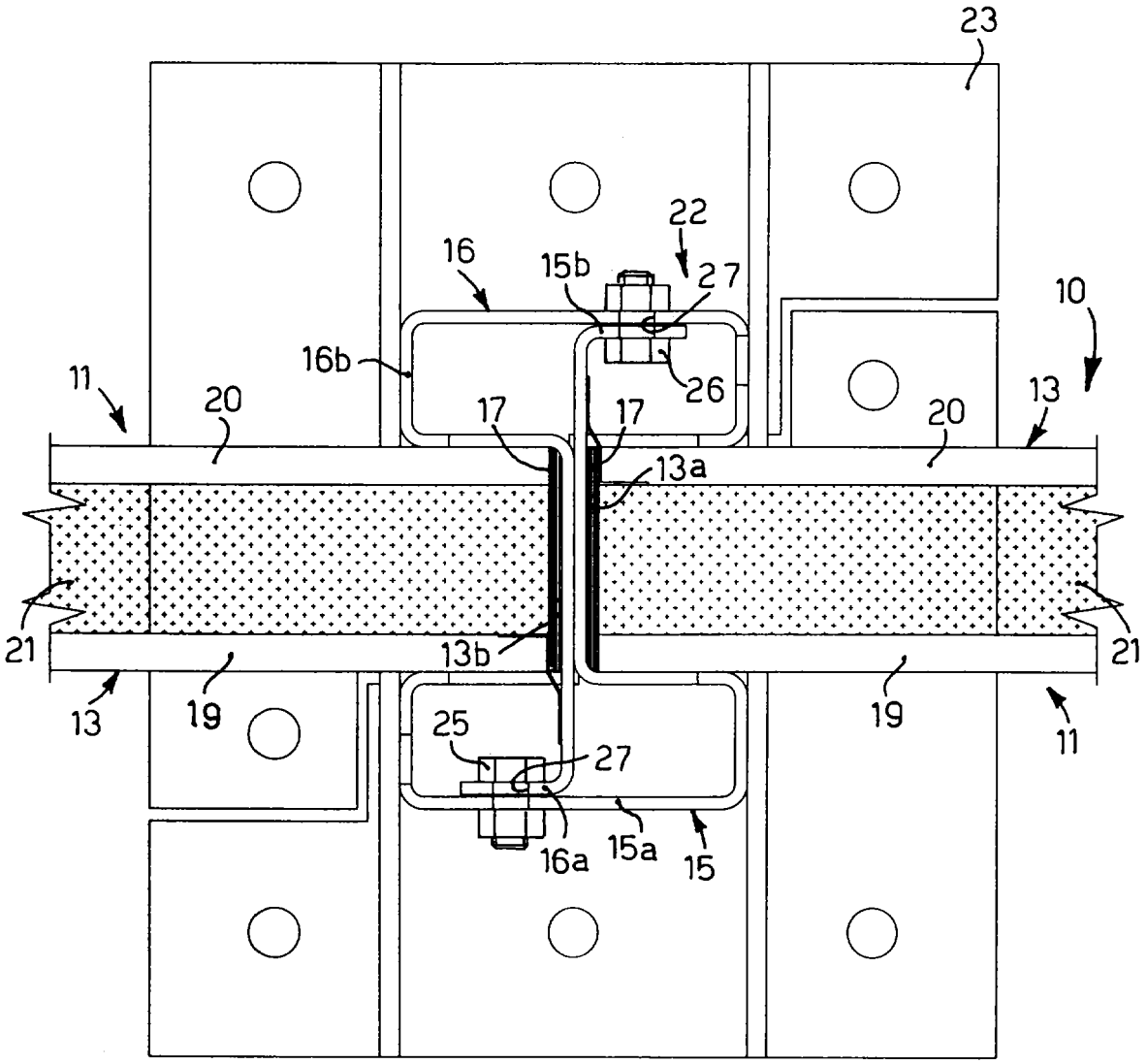
12

fig. 3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16b
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13a
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13b
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19
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11
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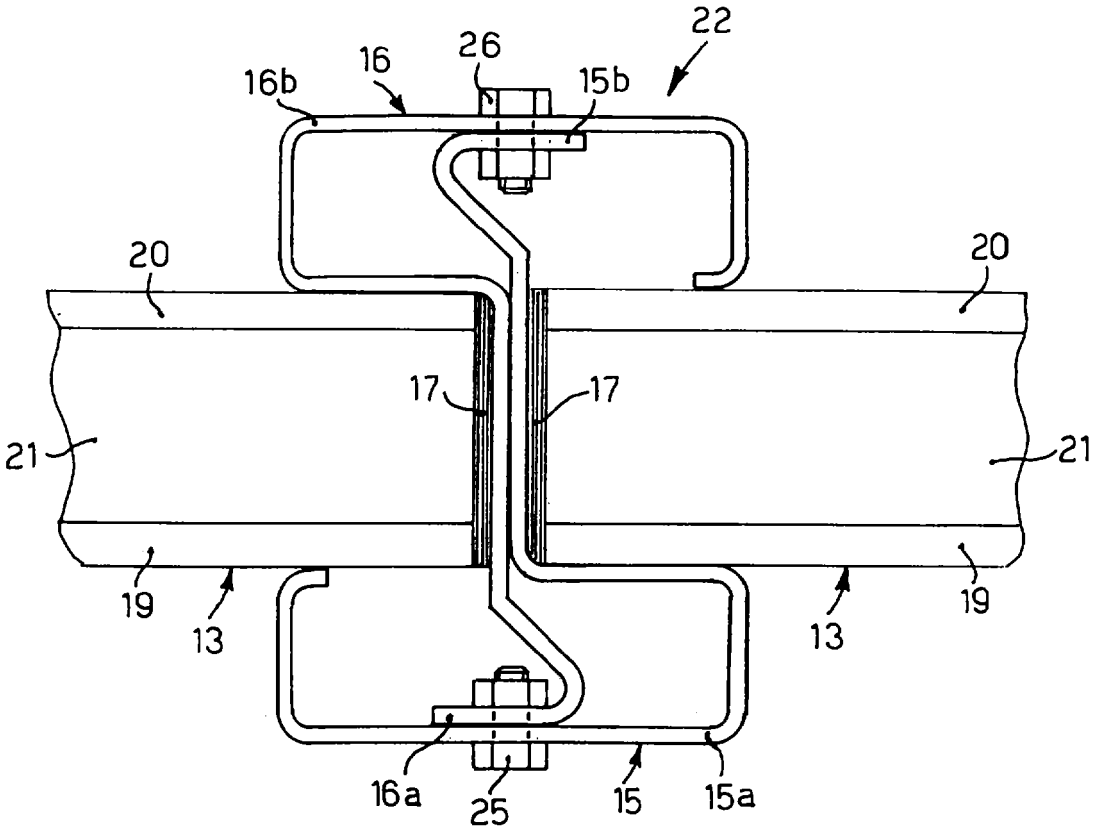
27
16a
15a
15

fig. 4


22
16
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17
21
21
19
13
13
19
16a
25
15
15a

fig. 5

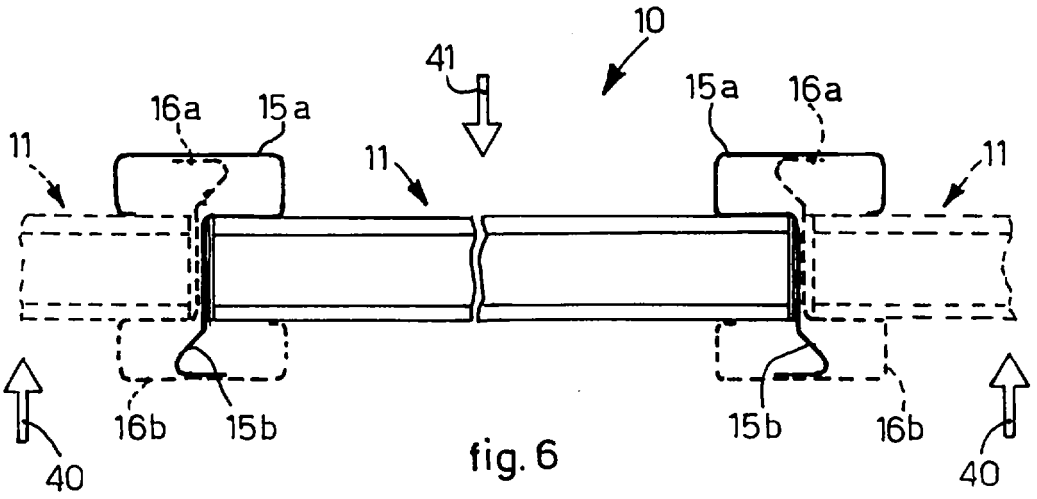
10
41
16a
15a
15a
16a
11
11
11
16b
15b
15b
16b
40
40

fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 5079

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X	US 3 390 504 A (ELTEN GERRIT JAN VAN) 2 July 1968 (1968-07-02) * figure 1 * * column 2, lines 53-59 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

E01F
E04H
E04C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 July 2007	Tran, Kim-Lien

CATEGORY OF CITED DOCUMENTS

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